Flow-Based Biochips: Fault-Tolerant Design and Error Recovery - DTU Orbit (08/11/2017)

Flow-Based Biochips: Fault-Tolerant Design and Error Recovery

The focus of this paper is on continuous-flow biochips, where the basic building block is a microvalve. By combining these microvalves, more complex units such as mixers, switches, multiplexers can be built, hence the name of the technology, “microfluidic Very Large Scale Integration” (mVLSI). Biochips are currently being designed manually using tools such as AutoCAD. Physical defects can be introduced during the fabrication process, which reduces the yield, and may lead to the failure of the biochemical application. Failure is costly because of the need to redo lengthy experiments, using expensive reagents and often hard-to-obtain samples, and can be safety critical (endangering human life), e.g., for important diagnostic procedures (screening for cancer). Researchers have started to propose fault models and test techniques for mVLSI biochips. To increase the yield, and to potentially also prevent the failure during the operation of the biochip, we advocate the use of fault-tolerant biochip design. The vision is to provide application fault-tolerance at run-time (online), detecting the faults as they appear, and reconfiguring the application. However, in this paper our assumption is that the faults are detected during testing, and that the operation of the biochip is reconfigured offline (at design time) to avoid the faults. We are interested to introduce redundancy such that the applications can still successfully run on a defective biochip. Redundancy is the addition of extra resources, normally not needed for correct operation, to be used for fault-tolerance.

General information

State: Published
Organisations: Department of Applied Mathematics and Computer Science , Embedded Systems Engineering
Authors: Pop, P. (Intern)
Number of pages: 1
Publication date: 2015

Host publication information

Title of host publication: Proceedings of the 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2015)
Publisher: IEEE
Article number: FrDT16.3
Main Research Area: Technical/natural sciences
Conference: 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Milano, Italy, 25/08/2015 - 25/08/2015
Source: PublicationPreSubmission
Source-ID: 118956364
Publication: Research - peer-review › Article in proceedings – Annual report year: 2015